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| 10/646,686 | 08/25/2003 | Daishi Yoshikawa | 116925 | 9969 |

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| EXAMINER | |
|---|---|
| CANTELMO, GREGG | |
| ART UNIT | PAPER NUMBER |
| 1795 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 12/20/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/646,686 | YOSHIKAWA, DAISHI | |
| | Examiner | Art Unit | |
| | Gregg Cantelmo | 1795 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *15 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *7-18* is/are pending in the application.

4a) Of the above claim(s) *7-16* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. In response to the amendment received October 15, 2007:

   a. Claims 7-18 are pending with claims 7-16 withdrawn from consideration as to a non-elected invention;

   b. The prior art rejections of record stand.

### *Response to Rule 1.132 Declaration*

2. The declaration filed October 15, 2007 has been entered and will be addressed in the response to arguments below.

### *Election/Restrictions*

3. This application contains claims 7-16 drawn to an invention nonelected with traverse. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claim 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Denton in view of U.S. Patent No. 6,437,011 (Steck) and WO 02/33709 (WO '709).

Denton discloses an electrolyte membrane comprising an inorganic glass fiber substrate impregnated with a proton conducting perfluorosulfonic acid (Example 1 as applied to claims 17-21). The proton conducting polymer and glass fiber substrate are integral with respect to one another (as applied to claims 19 and 20).

The differences between claim 17 and 18 and Denton is that Denton does not teach of the glass being a woven glass of the particular configuration recited in claims 17 and 18 or of the sheet being implanted in the polymer matrix so that the surface of the electrolyte is constituted of the polymer matrix and the embedded portion of the matrix being between 30% to 80% of the entire thickness of the matrix.

As to the glass being the particular configuration:

Use of both woven and non-woven glass materials as a mechanical core or substrate for a proton conducting electrolytic membrane is known in the art as shown by Steck (col. 10, ll. 55-60). Furthermore the instant application discloses that either woven or non-woven glass cores are suitable alternatives for the inorganic component of the membrane.

The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

As to the particulars of the fabric of the woven glass: First with respect to the size openings of the fabric and porosity, the ranges specified therein is a significantly vast range considering the membrane being employed as an electrolyte support membrane. Clearly, one of ordinary skill in the art would recognize that an electrolyte membrane would have 10-90% porosity so as to provide sufficient ionic conductivity across the glass fabric. Less than 10% porosity would adversely affect the ionic conductance of the fabric and thus make it an ineffective ion membrane support material. More than 90% porosity would obviously adversely affect the mechanical properties of the membrane which would create shorting between the electrodes. Thus a porosity range of 10-90%, which is an obviously vast porosity range, would have been clearly within the knowledge of one of ordinary skill in the art. Furthermore there is no clear evidence to show that this vast porosity range has any criticality. Generally, differences in ranges

will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

With respect to the size openings in the fabric:

As discussed above, the range specified therein is a significantly vast range considering the membrane being employed as an electrolyte support membrane. Clearly, one of ordinary skill in the art would recognize that optimization of the size openings would relate to the mechanical and ionic properties of the film, much the same way as the porosity, discussed above, would. Optimization of the spacing of the fabric provides for both improved mechanical support and ionic conductivity. Thus the claimed size openings would have been clearly within the knowledge of one of ordinary skill in the art since it would have optimized both the mechanical and ionic properties of the glass fabric support. Furthermore there is no clear evidence to show that this vast porosity range has any criticality. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

With respect to the sheet being implanted in the polymer matrix so that the surface of the electrolyte membrane is constituted of the polymer matrix:

As shown in Fig. 1, the electrolyte membrane is disposed between two glass sheets 2 to such an extent so that the reinforcing sheet 12 is entirely implanted in the polymer matrix 11 so that only the polymer matrix 12 is present at the surface of the electrolyte membrane.

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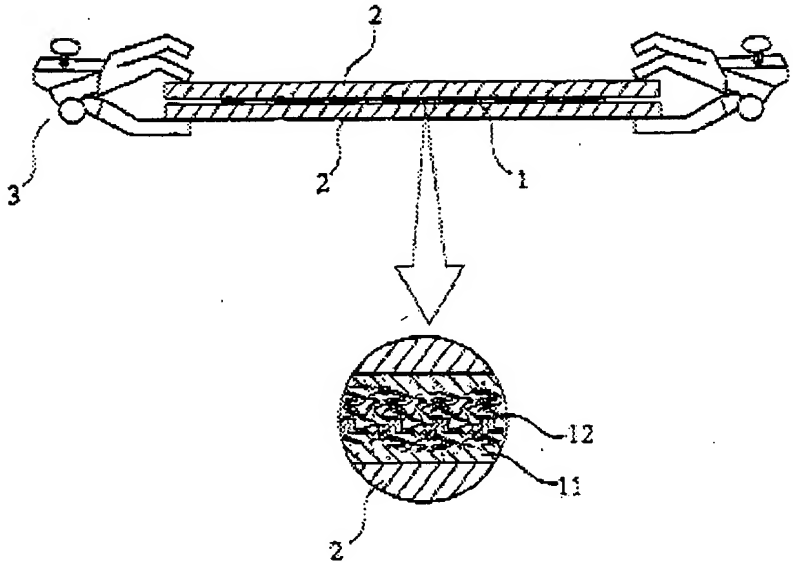


Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Denton by configuring the electrolyte membrane in the manner shown by WO '709 since it would have provided the predictable result of creating an polymer electrolyte membrane having both superior mechanical and ionic properties.

With respect to the sheet embedded portion of the matrix being from 30% to 80% of the entire thickness of the matrix.

Fig. 1 of WO '709 suggests that it is known in the art to provide a fabric support which is embedded within the matrix of the electrolyte and wherein said support is substantially less than the entire thickness of the matrix.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of to embed the fabric which would thus have a thickness less than the overall thickness of the polymer electrolyte matrix as shown by WO '709 since it would have provided both excellent ionic conductivity along the outer surface of the electrolyte while providing improved mechanical stability from the embedded fabric within the electrolyte. As to the particular claimed range of 30%-80% the figure therein reasonably suggests a configuration wherein the embedded fabric is about half the overall thickness of the electrolyte and thus reasonably suggests thickness arrangements which would render the claimed relationship obvious. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is

minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985).

***Response to Arguments***

5. Applicant's arguments with respect to claims 17 and 18 have been considered but are not persuasive.

Argument 1: Applicant argues that Steck does not teach or suggest a thickness of the sheet embedded within the matrix being between 30%-80% of the entire thickness of the matrix.

Such argument is not germane to the rejection above since Steck is not relied upon to teach or suggest any such feature. Rather such a feature is held to be obviated by the teachings of WO '709. Thus this argument is not persuasive.

Argument 2: Applicant argues that none of Denton, Steck and WO '709, alone or in combination, teach or suggest an electrolyte membrane that is intended for use in a fuel cell having an entire sheet that is implanted in the polymer matrix so that the surface of the electrolyte matrix is constituted of the polymer matrix and thickness of the sheet embedded within the matrix being between 30%-80% of the entire thickness of the matrix.

Applicant argues first that WO '709 does not teach or suggest that a support thickness is substantially less than the matrix and refers to various aspects of the disclosure of WO '709 to support Applicants allegations. However the Examiner is not persuaded by such arguments and disagrees with Applicant's assertions.

In response to Applicants first and second points:

The structure shown in Fig. 1 clearly shows the composite membrane disposed between the two glass sheets.

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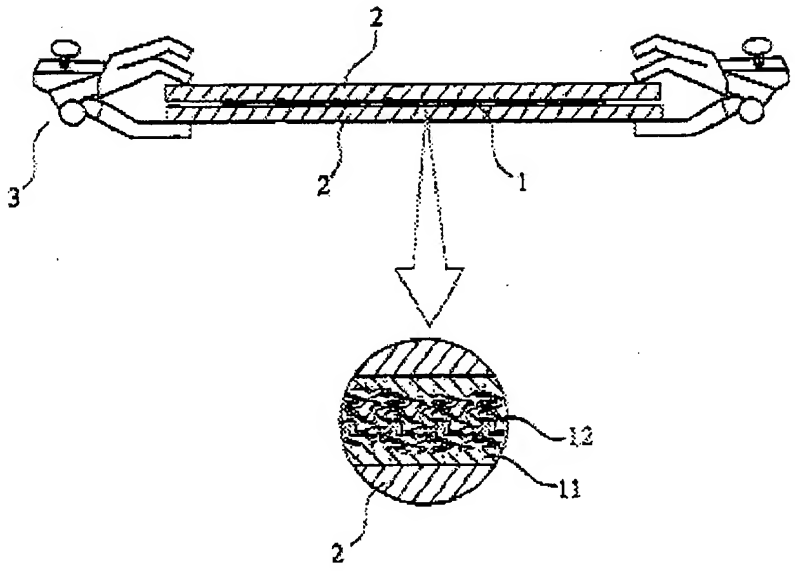


Therein the figure clearly shows that when clamped, the composite membrane has a configuration wherein the reinforcing structure 12 is completely embedded in the electrolyte matrix 11. The extent of the squeezing is at most to remove excess unsaturated monomer. This is not the same as stating that the mixture is squeezed to an extent whereby the reinforcing sheet contacts the support substrate as alleged by Applicant and that the resultant end product has a configuration where the reinforcing material has the same thickness as the matrix in which it is disposed and Applicants assertion fails to show any convincing evidence to support this assertion.

In addition, the electrolyte material and fibrous reinforcing member is compressible to squeeze out excess monomer mixtures after the product has been

polymerized. Thus the structure shown in Fig. 1 is in fact held to be the end structure of the composite membrane and that squeezing of the membrane (to any extent) is only a temporary state for the membrane so as to remove excess monomer. After squeezing the materials between the plates, the glass plates would be removed and the pressure applied to the composite material would be removed. The resilient nature of the composite electrolyte would expect to expand back to the configuration shown in Fig. 1. thus resulting in the structure shown in Fig. 1 wherein the reinforcing member 12 is fully embedded in the polymer matrix.

Applicants arguments fail to convincingly argue that the configuration of the final product is anything other than the structure shown in Fig. 1 and in the absence of such and in light of the full disclosure of WO '709, the Examiner contends that the structure shown in Fig. 1 would have been the final structure as reasoned above and such a structure would have been readily appreciated by one of ordinary skill in the art.

Regarding Applicants third argument, Applicant argues that WO '709 does not teach or suggest that the sheet embedded in matrix is 30% to 80% of the thickness of the matrix.

The Examiner respectfully disagrees. As shown in Fig. 2 the thickness of the reinforcing member is somewhat less than the thickness of the matrix in which the reinforcing member is disposed, one would reasonably expect that the figure suggests that the reinforcing member would be less than 100% of the matrix and, as suggested in Fig. 1 significantly less than 100% the thickness of the matrix, thereby rendering the upper portion of the claimed range (up to 80%) obvious.

Such a configuration would have been readily obvious based on the suggestive teachings of WO '709 since it would have been apparent that the configuration shown in Fig. 1 would have provided the predictable synergistic effects of having an electrolyte membrane having superior mechanical strength (in the form of the reinforcing member) while having superior ionic conductivity (in the form of providing the entire exterior of the composite membrane to be the ionically conducting polymer matrix alone).

Thus, the Examiner maintains that the configuration of Fig. 1 reasonably suggests a composite electrolyte wherein the reinforcing member 12 is embedded within the polymer matrix and of a thickness which is substantially less than the polymer matrix and thus reasonably obviates the upper claimed range of the thickness in claim 17.

Regarding Applicants fourth argument, Applicant argues that WO '709 teaches of reducing the amount of polymer and thus teaches away from the claimed composite electrolyte of claim 17.

The Examiner respectfully disagrees with Applicants arguments, notably that such arguments are not well presented in light of the full disclosure of WO '709.

The statement made regarding the thinner electrolyte is to making the composite polymer electrolyte thinner. This is not equivalent to stating that only the polymer portion itself is thinner relative to the reinforcing member. Rather the entire composite is made thinner.

Again, referring to the structure shown in Fig. 1 a reduction in thickness would reasonably be a proportional reduction in thickness of the entire composite while still maintaining the embedded reinforcing structure shown in Fig. 1.

Furthermore, the disclosure therein pertains to the disclosed invention. The reduction in thickness may be a further or alternative embodiment to other embodiments of WO '709 but that alone does not overcome the teachings of the reference in its entirety which, as argued above, still reasonably teaches/suggests embedding the reinforcing material within the polymer matrix. Again, such a configuration would have been readily obvious based on the suggestive teachings of WO '709 since it would have been apparent that the configuration shown in Fig. 1 would have provided the predictable synergistic effects of having an electrolyte membrane having superior mechanical strength (in the form of the reinforcing member) while having superior ionic conductivity (in the form of providing the entire exterior of the composite membrane to be the ionically conducting polymer matrix alone).

Thus, the Examiner maintains that the configuration of Fig. 1 reasonably suggests a composite electrolyte wherein the reinforcing member 12 is embedded within the polymer matrix and of a thickness which is substantially less than the polymer matrix and thus reasonably obviates the upper claimed range of the thickness in claim 17.

Regarding Applicants fifth argument, the arguments made therein are not persuasive since the claimed invention is only to the electrolyte membrane "intended for use in a fuel cell". Arguments made in this argument pertain to the alleged difference in

the combination of the electrolyte membrane in the fuel cell. Not only do the claims not require the combination given the fact that such a combination is intended use, but the claims further fail to require that the structural integrity of the claimed electrolyte membrane when in disposed in the final fuel cell stack exhibits the same structure as that required in claim 17. Even further, such may not be clearly persuasive absent a clear showing as well that the prior art product is incapable of meeting the same embedded reinforcing member having the same proportional thickness as recited in the claim.

Thus this argument is not persuasive.

Regarding the Declaration under 37 CFR 1.132:

The declaration has been considered but is not persuasive for the following reasons. First the claims do not require that the claimed product exhibit the properties stated in the declaration. Thus the claimed product is not necessarily limited to such properties. Second, the declaration does not show that the prior art combination does not reasonably teach or suggest the same properties alleged as been significant. Third the declaration fails to show that such properties are unobvious and unexpected. Rather, it is the Examiner's position that such properties would have been readily obvious to one of ordinary skill in the art. The structure shown in Fig. 1 shows an electrolyte whereby the polymer matrix is the sole material provided at the surface of the composite membrane.

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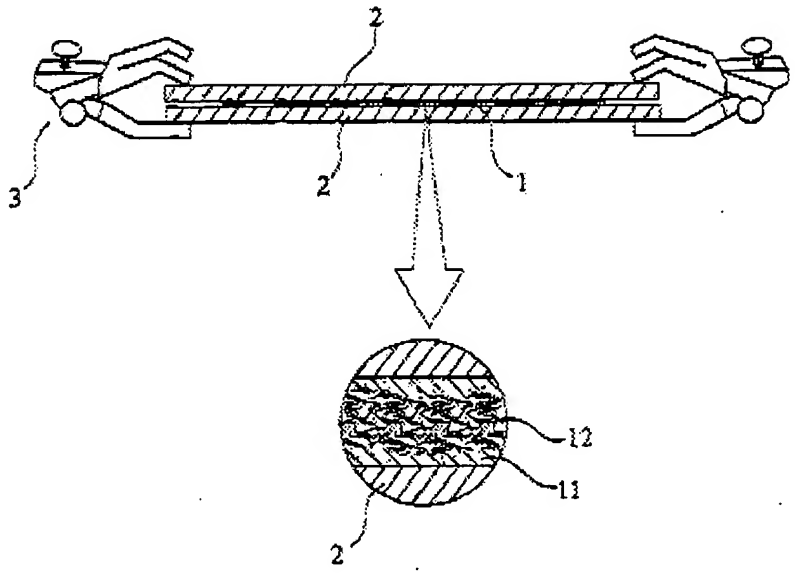


One of ordinary skill in the art would further clearly recognize that the polymer matrix is the ion conductive component of the composite matrix whereas the fibrous embedded portion 12 is provided as a reinforcing member to the membrane. Thus as stated above such a configuration would have been readily obvious based on the suggestive teachings of WO '709 since it would have been apparent that the configuration shown in Fig. 1 would have provided the predictable synergistic effects of having an electrolyte membrane having superior mechanical strength (in the form of the reinforcing member) while having superior ionic conductivity (in the form of providing the entire exterior of the composite membrane to be the ionically conducting polymer matrix alone). And varying the ratio of the thickness of the two relative to one another would have been an obvious result effective variable to optimize both the mechanical strength and ionic conductivity.

In light of the lack of convincing evidence provided in the Declaration and given the deficiencies in persuasiveness of the Declaration as stated above, the prior art rejection is still held to reasonably obviate the claimed invention.

For at least these reasons, claims 17-18 are not patentably distinct over the applied prior art references. Thus the rejection stands.

***Conclusion***

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is 571-272-1283. The examiner can normally be reached on Monday to Thursday, 8:30-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gregg Cantelmo
Primary Examiner
Art Unit 1795

gc
December 19, 2007